

CLAIMS.

1. A slurry loop reactor having one or more loops and comprising on at least one of the one or more loops either a by-pass line (2) connecting two points of the main loop (1) by an alternate route having a different transit time than that of the main route and/or a modified circulation pump with internal re-circulation, and/or a mixing element that improves the homogeneity of the circulating slurry.
2. The slurry loop according to claim 1 wherein the by-pass line carries a fraction of the slurry of from 0.5 to 50 % of the total flow rate.
3. The slurry loop according to claim 2 wherein the by-pass line carries a fraction of the slurry of from 1 to 15 % of the total flow rate.
4. The slurry loop according to any one of the preceding claims wherein the slurry traveling in the by pass line is re-injected in the main loop at an angle of from 1 to 90 degrees.
5. The slurry loop according to any one of the preceding claims wherein the ratio DB/DL of the diameter of the by-pass DB to that of the main loop DL is of from 1:12 to 1:2.
6. The slurry loop according to any one of the preceding claims wherein the ratio DB/DL of the diameter of the by-pass DB to that of the main loop DL is of from 1:6 to 1:3.
7. The slurry loop reactor according to any one of the preceding claims capable of improving the longitudinal mixing within the reactor, characterised in that the circulating pump operates at an efficiency between 30 to 75 %.

8. The slurry loop reactor of claim 7 wherein the pump efficiency is reduced by leaving an empty space between one or more blades of the impeller and the shroud of the pump.
- 5 9. The slurry loop reactor of claim 7 or claim 8 wherein the pump efficiency is reduced by the presence of holes in the impeller blades.
10. The slurry loop reactor according to any one of the preceding claims having fixed obstacle therein to improve the radial homogeneity of the flow in the
10 slurry.
11. Use of the slurry loop reactor according to any one of the preceding claims to improve the catalytic productivity without any loss of polymer production.
- 15 12. Use of the slurry loop reactor according to any one of claims 1 to 10 to increase the bulk density of the polymer product.
13. Use of the slurry loop reactor according to any one of claims 1 to 10 to increase the stable operation window.
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14. Use of the slurry loop reactor according to any one of claims 1 to 10 to improve the homogeneity of the longitudinal flow in the reactor.
- 25 15. Use of the slurry loop reactor according to any one of claims 1 to 10 to increase the solids content in the reactor by a factor of at least 1.5 %, said solid content being defined as the ratio of the particle mass flow rate to the total mass flow rate.
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